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FOUR WIREWORMS FOUND IN BLUEGRASS SOD

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SUMMARY

The wireworms *Aeolus dorsalis, Conoderes auritus, Conoderes bellus,* and *Conoderes lividus* are all very much alike in coloring and form. *A. dorsalis* and *C. auritus* are nearly the same size when mature, *C. bellus* is much smaller, and *C. lividus* much larger than the other three.

The most noticeable character for separating these wireworms is in the shape of the posterior part of the frons. This part of the frons is different in each species. The caudal notch on the ninth segment of *C. bellus* is small and oval shaped in contrast to the large V-shaped notches of the other species. The dorsum of the ninth abdominal segment of *C. lividus* bears two pairs of spines, the other species one pair each. The coloring of the spines or projections on the sides of the anal proleg helps distinguish *C. auritus* and *A. dorsalis.* There are also differences in the number of secondary setæ on an intermediate abdominal segment and in the number of setæ on the tenth abdominal segment and anal proleg.

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Four Wireworms Found in Bluegrass Sod

By H. H. JEWETT

A number of species of wireworms live in bluegrass sod in central Kentucky. Some of these become pests of crops that follow sod in rotations. Tobacco is one of the crops frequently injured severely. The species that have been found most frequently injuring tobacco plants are *Aeolus dorsalis* (Say), *Conoderes auritus* (Herbst), *Conoderes bellus* (Say), and *Conoderes lividus* (De Geer). Of these, *Aeolus dorsalis* is the most important pest and *Conoderes auritus* next in importance. *Conoderes bellus* frequently attacks tobacco but is a small wireworm and does little apparent damage. *Conoderes lividus* has been found injuring only an occasional tobacco plant, but is rather numerous in sod. This wireworm is the largest of the four species mentioned.

The four species of wireworms are very much alike in color, shape, and size at different stages of development and are difficult to separate. Examination of exuviæ of mature larvæ of the four species, however, shows a number of characters that make it possible to separate the species. Descriptions and figures of *Aeolus dorsalis* are given by Comstock and Slingerland (1) and Forbes (2). Slingerland (3) gives an illustration of this wireworm. Chittenden (4) gives an account of *Conoderes bellus* and states the wireworms are 6 to 6.5 mm long. Boving and Craighead (5) give figures of *Conoderes auritus* and *Conoderes lividus.*

DESCRIPTIONS OF LARVÆ

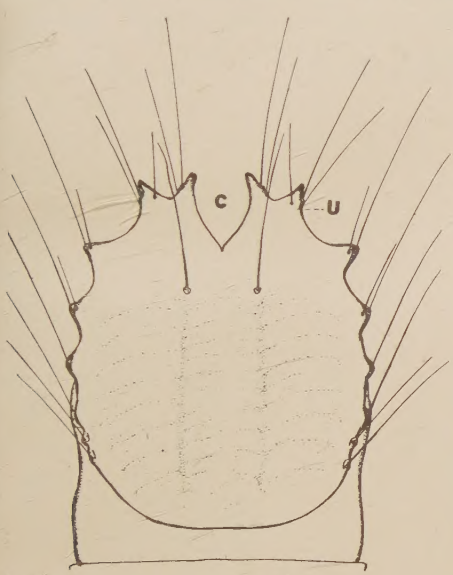
Aeolus dorsalis (Say). The color of this wireworm is light yellow with the dorsum of the first thoracic segment and sometimes a part of the second segment, tubercles on the ninth abdominal segment, tips of the branches of the urogomphi reddish-brown. The dorsum of the ninth segment is generally darker than the other abdominal segments. The region around the nasale, the mandibles, and the spines on the anal proleg are brown or partly brown. The surface of the body is smooth. The body is flattened dorso-ventrally and tapers slightly toward the head and ninth abdominal segment from the intermediate abdominal segments. The average length of 10 mature larvæ was 11.7 mm, range 10 to 15 mm. Average width of the head was 1.18 mm, range .98 to 1.43 mm; average length of the head from the nasale thru the frons .87 mm, range .77 to 1.01 mm. Ten last stage larval exuviæ gave an average width of the head of 1.19 mm, a range of .91 to 1.33 mm and an average length of the head of .87 mm, with a range of .63 to 1.01 mm.

The nasale is tridentate as is true for the other three species. The posterior portion of the frons is nearly cone shaped (Plate I, Fig. 4, F) and differs from that of the other species. The mandibles (Plate I, Fig. 3) are not notched and differ little from the other species.

The arrangement of the setæ on an intermediate abdominal segment is similar to that of *Conoderes auritus* (Plate II, Fig. 2) and the other species. All the species have the same number of primary setæ, but the number of secondary setæ may vary. The tergite of *A. dorsalis* bears 2 transverse rows of primary setæ, 2 setæ in the anterior row and 3 in the posterior row. The lateral sclerite bears 3 primary setæ. The sternum bears 3 setæ on the lateral portion, the anterior one being a short or secondary seta, and 2 primary setæ between these and a ventro-median line.

The ninth abdominal segment (Plate I, Fig. 1) is flattened with the dorsum somewhat convex cephalad and concave caudad. The dorsum is surrounded by a narrow margin which bears on each side a row of 5 or 6 tubercles. There are two distinct nearly parallel impressions with radiating lines on the dorsum. The

urogomphi curve upward and the inner branches partially enclose a large V-shaped notch (Plate I, Fig. 1, C). The urogomphus (Plate I, Fig. 1, U) has two divergent branches of nearly equal length; however, these branches vary in length more than they do in the other species.



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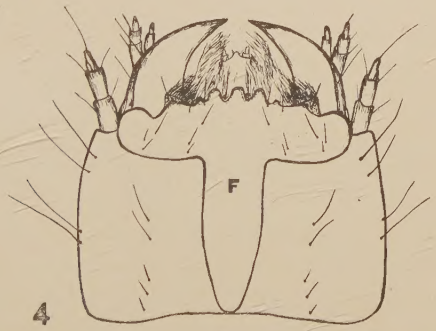

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Plate I. *Æolus dorsalis.* Fig. 1, dorsal view of ninth abdominal segment: C, caudal notch; U, urogomphus. Fig. 2, antenna. Fig. 3, dorsal view of mandibles. Fig. 4, dorsal view of head: F, frons.

The tenth abdominal segment bears on each side a group of setæ with a few small tubercles. These are connected cephalad by a row of setæ. The total number of setæ varied from 10 to 18. The anal proleg bears a circular row of setæ. The number on the cephalic half varied from 4 to 8 and on the caudal half 7 to 11. The anal proleg also bears on each side a blunt spine or projection. This is dark colored or partly colored.

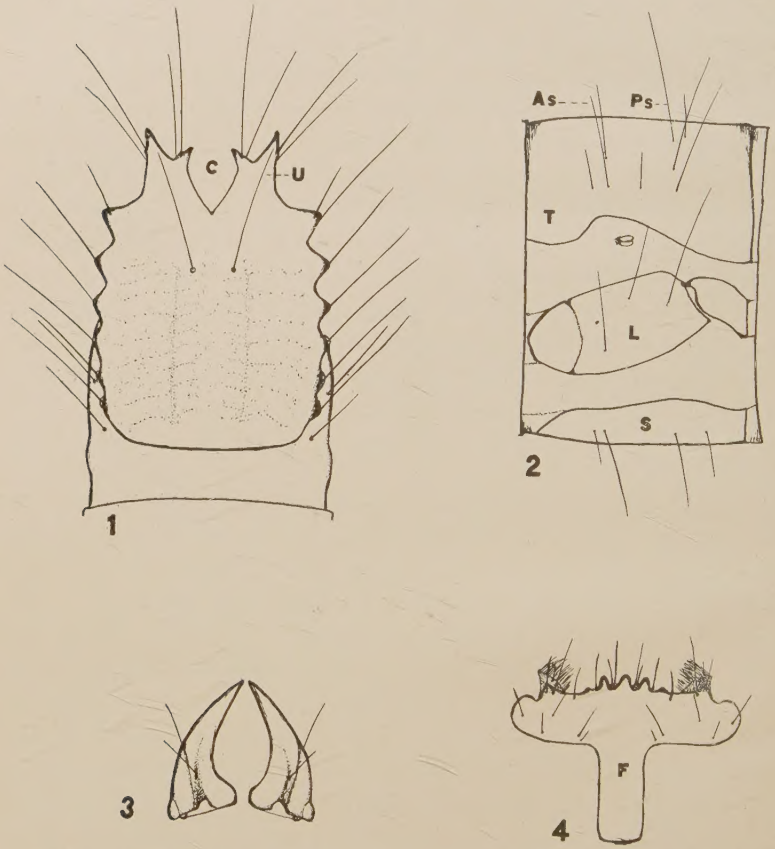

Plate II. *Conoderes auritus.* Fig. 1, dorsal view of ninth abdominal segment; C, caudal notch; U, urogomphus. Fig. 2, intermediate abdominal segment: T, tergite, As, anterior row of setæ, Ps, posterior row of setæ; L, lateral sclerite; S, sternum. Fig. 3, dorsal view of mandibles. Fig. 4, F, frons.

Conoderes auritus (Herbst). The color is practically the same as of *A. dorsalis*. The body is flattened and tapers to the head from the thorax, but there is slight tapering of the abdominal segments, the ninth being the smallest. The body is smooth and shining. The average length of 10 larvæ was 12.5 mm. The average width of the head was 1.27 mm, the range 1.15 to 1.33 mm. The average length of the head was .65 mm, the range .46 to .70 mm. Ten last-stage larval exuviæ gave an average width of the head of 1.24 mm, the range .98 to 1.33 mm; the average length of the head .64 mm, range .49 to .70 mm.

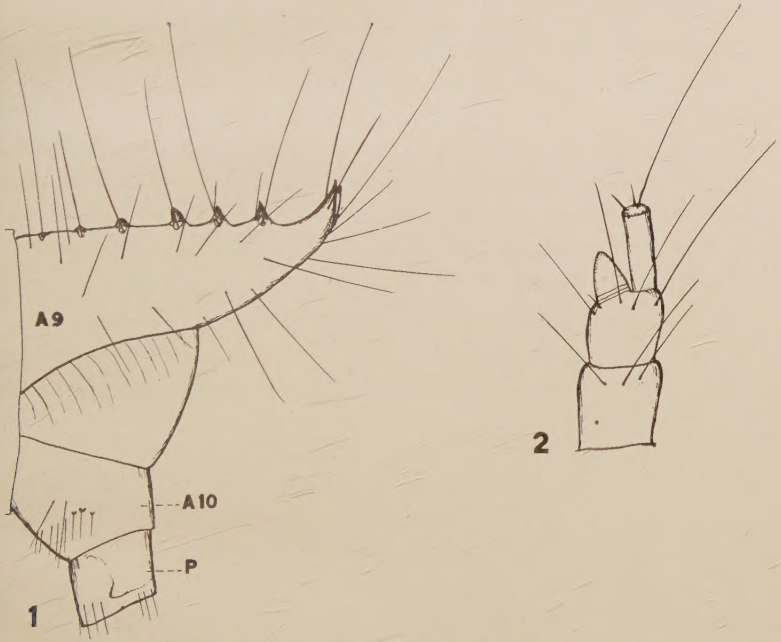

Plate III. *Conoderes auritus.* Fig. 1, lateral view of ninth and tenth abdominal segments: A9, ninth segment; A10, tenth segment; P, proleg. Fig. 2, antenna.

The posterior part of the frons (Plate II, Fig. 4, F) is rectangular-shaped which is different from the other species. The mandibles and antennæ differ little from those of *A. dorsalis*. The setal arrangement on an intermediate segment is shown on Plate II, Fig. 2. The tergite bears 5 primary and 3 secondary

setæ; the lateral sclerite, 3 primary setæ; the sternum on the lateral portion, 2 primary and 2 secondary setæ; and 2 primary and 2 or 3 secondary setæ in a line between these and the ventro-median line. In this line, 1 secondary seta is situated cephalad to each primary seta and sometimes 1 seta caudad to the posterior primary seta.

The ninth abdominal segment is similar in shape to that of *A. dorsalis,* the dorsum being slightly more rectangular than that of *A. dorsalis.* The outer branches of the urogomphi (Plate II, Fig. 1, U) are larger and longer than the inner branches.

The number of setæ in the groups on the sides of the tenth abdominal segment (Plate III, A 10) and in the line of setæ between them, ranged from 16 to 22 for 10 specimens. The number of setæ in the cephalic half of the row around the anal proleg (Plate III, P) ranged from 6 to 8 and in the caudal half 10 to 14. There were 6 setæ in the cephalic half on 9 of the 10 specimens examined. The blunt spine or slight projection on each side of the proleg is not colored or darkened, as is true for *A. dorsalis.*

Conoderes bellus (Say). This wireworm is similar to *A. dorsalis* in shape and color, tubercles and tips of urogomphi on the ninth segment not as dark. Two specimens measured 5.2 and 5.7 mm in length. The heads were .56 and .59 mm wide and .42 mm long. Three last-stage larval exuviæ were measured, the heads of 2 were .56 mm wide and the third .49 mm wide, length of the heads of the 3 was .35 mm. Chittenden (4) gives a larval length of 6 to 6.5 mm.

The posterior part of the frons (Plate IV, Fig. 4, F) is truncate at the base and is club shaped which is different than the other species. The mandibles (Plate IV, Fig. 3) are broad at the base and not notched. The papilla on the antenna (Plate IV, Fig. 2, P) is less cone shaped than is true of the other species.

An intermediate abdominal tergite bears 2 transverse rows of primary setæ, 2 in the anterior and 3 in the posterior row. The lateral sclerite bears 3 primary setæ. The lateral portion of the sternum bears 2 primary setæ and there are 2 on the sternum between these and the ventro-median line. The dorsum of the

ninth abdominal segment has a small, oval-shaped caudal notch (Plate IV, Fig. 1, C) which is practically enclosed by the inner branches of the urogomphi. The notch differs markedly from the caudal notches of the other species. The outer branches of the urogomphi are larger and longer than the inner branches.

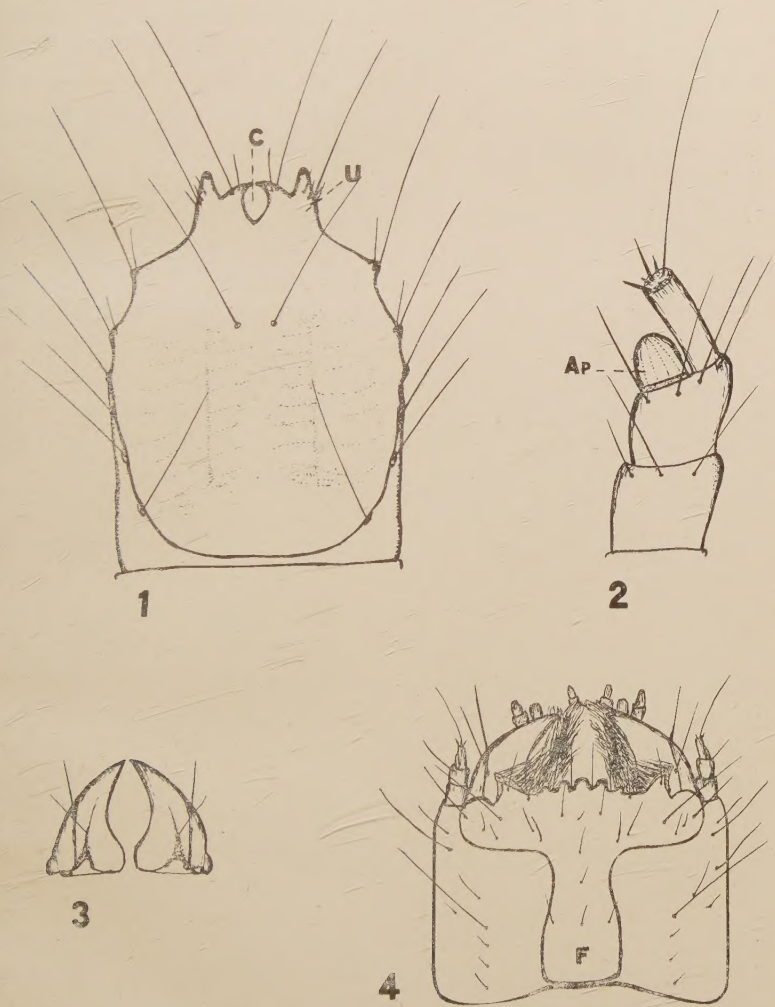

Plate IV. *Conoderes bellus*. Fig. 1, dorsal view of ninth abdominal segment: C, caudal notch; U, urogomphus. Fig. 2, antenna: Ap, papilla. Fig. 3 dorsal view of mandibles. Fig. 4, dorsal view of head: F, frons.

The setæ in the groups on the sides of the tenth abdominal segment and the row of setæ connecting the groups totaled 18 and 16 on each of 2 larvæ. The cephalic half of the circular row of setæ around the anal proleg contained 4 setæ and the caudal half 10 setæ on each of 2 larvæ.

Conoderes lividus (De Geer). The color of the wireworm is the same as that of *A. dorsalis* but a shade darker. The thorax tapers slightly toward the head and the abdominal segments very slightly toward the ninth segment which is the smallest. The body is flattened. The average length of 10 worms was 21.1 mm, the range 18 to 25 mm. The average width of the head was 2.13 mm, the range 1.92 to 2.87 mm. The average length of the head was 1.2 mm and the range 1.05 to 1.47 mm. The heads of 10 last-stage larval exuviæ had an average width of 2.41 mm and a range of 2.1 to 2.8 mm, and an average length of 1.31 mm with a range of 1.12 to 1.54 mm.

The posterior part of the frons (Plate V, Fig. 3, F) is truncate at the base, constricted on the sides, and is vase shaped. The shape of the frons is different from that of the other species. The papillæ on the antennæ are small and cone shaped.

The setal arrangement on an intermediate abdominal segment is similar to that of *C. auritus*. There are 2 transverse rows of primary setæ on the tergite. The tergite of *Conoderes auritus* bears 1 secondary seta cephalad to each row, and 1 caudad to the posterior row, while the tergite of *C. lividus* may bear 1 to 3 secondary seta cephalad to each row and 1 and sometimes 2 caudad to the posterior row. The lateral sclerite bears 3 primary and 1 secondary seta. The sternum bears 2 primary and 2 secondary setæ on the lateral portion of the sternum and 2 primary and 2 secondary setæ between these and the ventro-median line. In this line, 1 secondary seta is situated cephalad to each primary seta.

The caudal notch on the dorsum of the ninth abdominal segment is V-shaped. The outer branches of the urogomphi are larger and longer than the inner branches. The dorsum of the ninth abdominal segment bears 2 pairs of long setæ (Plate V, Fig. 1) situated between the longitudinal impressions and equi-

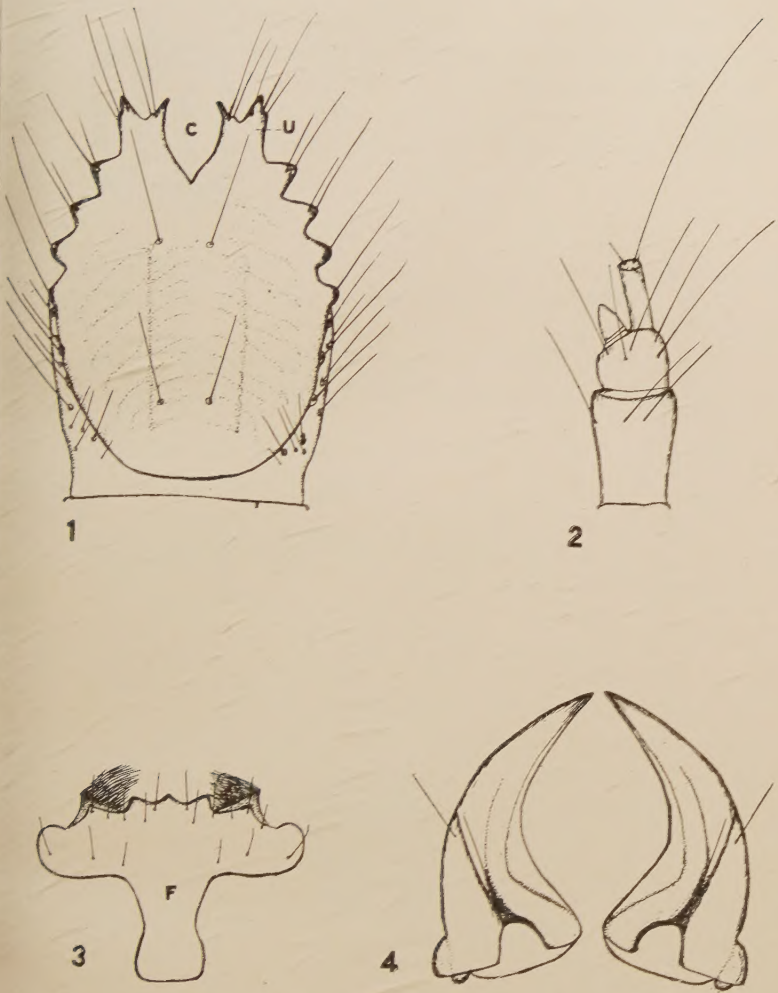

Plate V. *Conoderes lividus.* Fig. 1, dorsal view of ninth abdominal segment; C, caudal notch; U, urogomphus. Fig. 2, antenna. Fig. 3, F, frons. Fig. 4, dorsal view of mandibles.

distant from the cephalic margin and the caudal notch. The cephalic pair is smaller but always present. This pair is lacking on the other species. The number of setæ in the groups on the sides of the tenth abdominal segment and in the row connecting

them varied from 30 to 44 on 10 specimens. The cephalic half of the row of setæ surrounding the anal proleg contained 4 setæ. This number was constant for 10 specimens. The caudal half of the row contained from 11 to 20 setæ. The spines on the sides of the anal proleg are prominent and brown or blackish.

CITATIONS

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5. Boving, A. G. and Craighead, F. C. 1931. Entomologica Americana 11 (N. S.) (3, 4): 256-257